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lumen of the uterus. So it is fed upon only by the sperm itself.

The nematodes should, therefore, be placed in Faure-Fremiet's (1910) fourth class of mitochondria-bearing sex-cells, in which these granules produce yolk.

Marcus, Mayer, Romien and Faure-Fremiet use the term mitochondria to describe minute plastin granules found in the nucleus of the spermatogonium and in both nucleus and cytoplasm of the spermatocyte. They are easily seen in the "perinuclear zone" of the spermatid and in the "crown" of the spermatozoon. But nowhere do these granules take Benda's Krystal violet stain or transform into any cell structure. Hence they have no relationship with true mitochondria. Meves recognizes their nature and origin and calls them plastochondria. Van Beneden called them "protoplasmic corpuscles"; Altmann, "microsomes"; Boveri, "archoplasm." But none of these observers attributed any importance to them as bearers of hereditary characters. Meves (1910), however, finds (like the brothers Roja, 1891) that these granules fuse with similar ones in the egg after fertilization occurs, and he believes, with only this observation as a basis for it, that these plastochondria are the bearers of paternal structural characteristics. I have carefully studied the origin and behavior of these granules throughout the spermatogenesis and find that they everywhere behave, like the plasmosome itself, as if they were waste products of the metabolic processes of the chromatin. Many of them are actually thrown off by the spermatid with the cytoplasmic lobe, not only in *Ascaris,* but in many other forms. They always take plasma stains, yellow after Benda, and red after Ehrlich-Biondе, both reactions characteristic of secretions; they are pulled about in the cell by the force of the centrosomes to form aster rays and spindle fibers of the cleavage figure; they never divide, nor grow except by fusion on actual contact; in short, they behave everywhere as inert formed products only.

I believe that the observed facts of artificial parthenogenesis, hybridization and fertilization of enucleated eggs, all argue against Meves' interpretation of the rôle of the plastochondria; while these facts and the observations of Baltzer, Tennant and others show clearly that it is the retention or elimination of chromatin (or the karyochondria) that determines the inheritance of paternal characters, segregation and dominance.

EDWARD E. WILDMAN

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION E—GEOLOGY AND GEOGRAPHY

The sixty-fourth meeting of Section E, Geology and Geography, of the American Association for the Advancement of Science, was held in the geological lecture room, main building, Case School of Applied Science, December 30, 1912, to January 2, 1913. Vice-president James E. Todd presided. The address of the retiring Vice-president, Professor B. Shimek was given on the subject, "The Significance of the Pleistocene Mollusks." Much interest was taken in the papers, which are here given with abstracts:

Esker Terraces in Ohio: G. FREDERICK WRIGHT.

The Wisconsin Drift-plain in the Region about Sioux Falls, S. D. (illustrated): J. ERNEST CARMAN.

The region considered lies to the south of Sioux Falls along the line between Lincoln and Minnehaha counties, South Dakota. Professor Todd and others have interpreted it as belonging to the Wisconsin drift-plain, being an eastward projection of the James River lobe to the Big Sioux Valley. Professor Shimek has recently decided that the region is a Kansan drift-plain and not Wisconsin. The present paper describes the characteristics of this plain north and west of Shindlar and compares it with the typical Kansan region to the north and east. The evidence, chiefly physiographic, indicates that the region is a Wisconsin drift-plain. The conclusions of the paper support, in the main, the earlier interpretation of Professor Todd.

The Pleistocene Succession in Wisconsin: SAMUEL WEIDMAN.

A brief statement is given concerning present knowledge of the drift and associated surface deposits in Wisconsin, with a map showing distribution of the formations. There appear to be

five drift sheets exhibited in Wisconsin, as follows: First drift, a very old, thin drift; second drift, a very old, thick drift correlated with the Kansan of northeastern Iowa; third drift, a relatively old, thin drift, correlated with the Iowan of northeastern Iowa; fourth drift, a relatively thin, fresh drift, correlated with the early Wisconsin of northeastern Illinois; fifth drift, the Wisconsin drift. Extensive alluvial and lacustrine deposits in old valleys and lowlands, of interglacial origin between the second and third drifts. The loess deposits are of later origin than the third drift and older than the fourth.

The "Moraines" of Kansas: J. E. TODD.

Certain bouldery hills have been designated as glacial moraines by several writers on Kansas geology. This paper discusses their locations and relations to the former Kansan Ice sheet and present lines and levels of drainage and shows that they are not true moraines but river-laid deposits.

Traces of an Early Wisconsin Flood: J. E. TODD.

Attention is called to a deep silt which fills portions of the valleys of the Missouri and Kansas rivers in eastern Kansas, and which can not be correlated with the loess, because of its lower level. Because of evidences of the excavation of the valley so filled during and after the Kansas stage of the ice, it is argued that the date of the deposition of the silt was coincident with the recession of the Early Wisconsin Ice, or more definitely after the formation of the Altamont, or first marginal moraine. This lower loess or terrace silt is further provisionally correlated with terraces along the Missouri further north and its tributaries in western Iowa.

The Sangamon Interglacial Stage in Minnesota: WARREN UPHAM.

Three chains of lakes on the till area of Martin County, one of the central counties of the southern tier in Minnesota, adjoining Iowa, are ascribed to interglacial erosion of rivers flowing south, where now the courses of drainage pass eastward. The duration of this interglacial stage is estimated by Winchell, from changes of the course of the Mississippi River in and near the Twin Cities of Minneapolis and St. Paul, to have been about 15,000 years. It seems to be represented in the history of the Quaternary lakes Bonneville and Lahontan by the stage of their desiccation between their previous prolonged stage of high water and their ensuing higher but more brief rise of water; and it is correlated with the Sangamon interglacial stage between the Illinoian and Iowan stages of glaciation. Its time is estimated to have been approximately from 40,000 to 25,000 years ago.

The Relation of the Keewatin and Labrador Areas of Glaciation: WARREN UPHAM.

The Kansan and Illinoian drift sheets are regarded as mainly of contemporaneous age. They were deposited respectively by the farthest southward extensions of the Keewatin and Labrador icefields. The belt of confluence of these icefields extended from the borders of the drift northward along or near the course of the Mississippi River up to the Wisconsin driftless area, which also reaches short distances into Illinois, Iowa and Minnesota. Beyond the driftless area, these Keewatin and Labrador currents of the continental ice-sheet were confluent along a belt or line passing north-northwesterly through Minnesota to the vicinity of Winnipeg, Manitoba and onward along the axis of Lake Winnipeg. At St. Paul and Minneapolis and northward, fluctuations of the line of confluence during the Wisconsin stages of glaciation produced extensive interbedding and sometimes a confused mingling of the Keewatin and Labrador drift formations.

Types of Iron Ore in Tennessee: C. H. GORDON.

Read by title.

Criteria for Distinguishing Various Sorts of Common Deposits (illustrated): A. C. TROWBRIDGE.

The Age of the Mesabi Iron-bearing Rocks of Minnesota: N. H. WINCHELL.

This paper gives a very brief summary of former opinion, and presents new evidence which goes to show that the Mesabi rocks are a part of the great Keweenawan formation.

Angular Amphitheaters of the Grand Canyon: CHARLES R. KEYES.

One of the most perfectly enigmatical features concerning the physiognomy of the Grand Canyon, in Arizona, and one to which little especial attention has been directed, is a certain regularity in the notably serrated character of the walls. Buttresses, reentrants and pyramids have a conspicuously rectangular ground-plan. So pronounced is this characteristic and so large is the scale that it is even emphasized in the latest contour-maps of the district. The angularities of the buttresses and pyramids are readily explained by the double system of master-joint structure. The deep reentrants or amphitheaters are not so easily disposed of, especially since all of the surface drainage, which is very deficient, of the general plateau

on either side of the canyon is directed away from the margin of the walls and not into the great trough. In some cases these reentrants are partially accounted for by the presence of faults trending transversely to the course of the river. In the majority of other cases the amphitheaters, great and small, appear to have originated through undercutting by differential wind action, the deflative effects being much more vigorous on the soft shales lying between the hard Carbonic limestones forming the upper wall and the hard granite floor of the inner canyon.

Geologic Significance of Enisled Relief: CHARLES R. KEYES.

Sharp meeting of lofty mountain and even plain, seemingly as level as the ocean strand-line, is one of the most characteristic features of desert landscapes. Foothills are also conspicuous by their absence. The very deficient rainfall of such regions can not possibly produce such topographic peculiarities. On the Mexican tableland, for instance, where the geologic structure presents a great thickness of soft later deposits, and the whole selberglandschaft of the Germans is probably more ideally perfect than anywhere else on the globe. A number of typical illustrations are described. The phenomena are best explained by the action of regional eolation, or general leveling and lowering of the country through deflation.

Some Upland Flats in Jo Davies County, Illinois: A. C. TROWBRIDGE.

An attempt to distinguish between raised peneplains, structural plains, plains of marine deposition and plains of marine erosion, in regions of nearly horizontal strata.

The Value of Geochemistry to Geology and Geography: J. CULVER HARTZELL.

The author stated that geology is the history of the earth, including organisms; geography is that part of geology which deals with the surface of the earth, and man in particular, and his relations to topographical, cultural, political and climatic environments. We are apt to forget the relations which the atmosphere, the hydrosphere and lithosphere bear to each other. Diastrophism, vulcanism and gradation are important; but the geochemistry is as important as the mechanics when changes in the equilibrium of chemical systems and their relation to man are considered. Atoms are different manifestations of one primal force. The farther we get away from *primal* the more distinct *chemical* and *physical* seem. There are pure and applied methods of procedure; but the pure and applied principles are interdependent in the proper and accurate interpretation of facts. The value of geochemistry lies in the fact that it touches every division of geology in both its philosophy and its applicability. We need to get away from a sole contemplation of finished products. All forces are so balanced as to produce systems which are more or less stable; but which may be disturbed in such a way as to produce new systems which may in turn become more or less stable. These disturbances in equilibrium are as vital to the geologist as the system *per se*. We know a little about the balancing of forces; but the balancings are so multifarious as to be almost overwhelming, and it is only by careful, persistent investigation, interpretation and application of forces and the formulation of laws (perhaps tentative) that we can hope to know the genesis of any one system and its possible disturbance, thus accumulating a mass of data relative to many systems the final interpretation of which will make clear many of the heretofore apparently unsolvable problems. Stability, unstability and disturbance cross our path and we must determine their relations. The atmosphere, hydrosphere and lithosphere were discussed. The reactions which take place, the manner and time of occurrence, the phenomena and the final results are the problems of the geochemist. The solution of these problems has a direct bearing on topographical, cultural, political and climatic effects as well as on diastrophic, volcanic and gradational effects. They also have a direct bearing on the igneous, metamorphic and unconsolidated portions of the lithosphere as well as on the morphological and mathematical relations of minerals and their chemical molecular arrangement, and the conditions of fossilization with reference to the changes in the solid parts of organisms.

The author is greatly indebted to Dr. Frank Wigglesworth Clarke's "Data of Geochemistry," and to Alfred H. Brooks's presidential address before the Geological Society of Washington, December 13, 1911, for the thoughts here presented.

Gas and Oil Wells near Oberlin, Ohio: GEORGE D. HUBBARD.

Exploitation of the Clinton sands of the Clinton formation northward from the Bremen field to Lorain County has gone far enough to find several good wells in the vicinity of Oberlin. Mostly gas of good quality; some yield oil too. Gas is found at a depth of about 2,170 feet below

surface which is at about 750 feet. Section contains much water in the limestones, also several feet of salt. Anticlinal theory does not seem to apply; gas is apparently in pockets or lenses of the sand in the calcareous shales. These sand beds are not continuous. Rock pressure varies in different wells from 600 to 950 pounds, and flow from 1,000,000 to 5,000,000 cubic feet per day.

The History of the Bajadas of the Tucson Bolson of Arizona: S. S. VISHER.

The bajada is the long, gentle slope of detrital material at the foot of the mountains in bolsons or areas of centripetal drainage. The bajadas near Tucson have a length of about 10 miles and an average slope of 2° or 100 feet per mile. In spite of a difference of 8° or more in slope between the lower four miles of the canyons and the upper four miles of the bajada, erosion is now taking place on all portions of these thick terrestrial deposits. The explanation for this widespread erosion has been sought by many. The higher portions would, as shown by Salisbury, be eroded as the highlands were lowered, but not the lower portions, nor are certain other features to be thus explained. Over-grazing does not appear to be a sufficient cause. Davis concludes that in maturity the adjustment between one bolson and an adjacent lower one may result in the terracing in the higher. Changes of climate have been advocated: Barrell considers that bajadas were formed during the various glacial epochs and have since been destroyed; Huntington believes bajadas were formed in the interglacial epochs, of material which accumulated in the mountains during the glacial epochs. The present terracing he correlates with a recent increase of precipitation. The latter apparently opposing theories for bajada formation are in this region seemingly both essentially correct—Barrell's of the bajadas surrounding the lower, barren, warmer ranges, and Huntington's those of the higher, forested, cooler mountains upon which glacial conditions were approached since the bajadas of the former are more gentle, have a smaller percentage of clay and are more extensively eroded than those of the larger ranges. The frequency of freezing temperatures are believed to be important. At Tucson a decrease of 10° F. would increase the frequency about 200 per cent. and a 20° decrease would result directly in frost about 250 nights in the year. A different distribution of the precipitation would greatly effect the vegetal covering. The percentages of clay and boulder formation would fluctuate accordingly as would also accumulation and transportation. The Tucson bajadas appear to have been mainly formed at a time when the average temperatures were 10° or more lower; when the precipitation was greater and more uniform—either chiefly late in the glacial epochs (smaller ranges) or at their close (larger ranges). The present terracing is perhaps due to an increase in temperature and a different distribution and amount of rainfall abetted by the advancement of the area in the geographic cycle.

The Relation of the Lime Creek Shales to the Cedar Valley Limestones of Floyd County, Iowa: A. O. THOMAS.

The Devonian system of Iowa is represented by sediments belonging to two series, the Middle and the Upper Devonian. The stages of the Upper Devonian do not overlie each other, but each is locally developed and geographically separate. Moreover, each lies unconformably on the Cedar Valley stage of the Middle Devonian. Field study in Floyd County on the areal distribution and geological relations of the Lime Creek stage of the Upper Devonian has demonstrated a widespread unconformity at its base. A new substage, for which the name Nora limestone is proposed, is added as the lowest member of the Lime Creek stage.

A Four Mile Section along the Missouri River South of Columbia, Missouri: E. B. BRANSON.

Strata are well exposed along the bluff of the Missouri River and are, in general, nearly horizontal. Eight distinct and well-exposed unconformities occur within four miles.

The Relation of Geological Activity to Conservation of Soil and the Waters of Flowing Streams: LUELLA AGNES OWEN.

A view of the advance of geology as a science, and of early geological research, shows the growing appreciation of the all-important power of water in the development and progress of continents as well as their destruction or partial denudation for continual rebuilding. All atmospheric forces unite their energy with that of the flowing streams in every land to work without rest in tearing down the high places of the earth and transporting the waste for renewal of valleys and building new coast lines. So, the present geological epoch is preeminently the Age of Rivers, and in necessary works of conservation man may change the application of natural law to meet his needs and pleasure, but the law itself is unchangeable.

Rock Classifications in Three Dimensions: Alexander N. Winchell.

Believing that tabular classifications are desirable because of their simplicity, but that, as previously devised, they are unnecessarily limited in their presentation of mutual relationships, a new classification of igneous rocks is presented which is in tabular form in three dimensions. It is based largely upon the principles and work of Rosenbusch, but it differs from his usage in various important respects, so that responsibility for it must lie with the author.

Geo. F. Kay,
Secretary Section E

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

The one hundred and sixty-second regular meeting of the society was held at Columbia University on Saturday, February 22, extending through the usual morning and afternoon sessions. The attendance included thirty-eight members. Ex-president H. S. White occupied the chair, being relieved by Professors E. W. Brown and Frank Morley. Sixteen new members were admitted: Professor E. P. Adams, Princeton University; Dr. H. L. Agard, Williams College; Professor Fiske Allen, Kansas State Normal School; M. Farid Boulad, Egyptian State Railways; Professor J. A. Caparo, Notre Dame University; Mr. C. H. Clevenger, Kansas State Agricultural College; Dr. A. L. Daniels, Jr., Yale University; Mr. W. Van N. Garretson, University of Michigan; Mr. G. M. Green, Columbia University; Mr. C. E. Love, University of Michigan; Dr. Thomas Muir, Education Office, Capetown, S. A.; Mr. J. A. Nyberg, University of Wisconsin; Dean Marion Reilly, Bryn Mawr College; Professor B. L. Remick, Kansas State Agricultural College; Professor W. V. Skiles, Georgia School of Technology; Mr. J. N. Vedder, University of Illinois. Five applications for membership were received.

The society is about to publish the lectures delivered at the Princeton colloquium in 1909 by Professors G. A. Bliss and Edward Kasner.

The following papers were read at this meeting:

Harris Hancock: "A theorem in the analytic geometry of numbers."

B. H. Camp: "The expression of a multiple integral as a simple integral."

G. M. Green: "Projective differential geometry of triple systems of surfaces."

C. A. Fischer: "A generalization of Volterra's derivative of a function of a curve."

L. B. Robinson: "Notes on the theory of systems of partial differential equations."

Oswald Veblen and J. W. Alexander, II.: "Manifolds of n dimensions."

R. G. D. Richardson: "Oscillation theorems for linear homogeneous self-adjoint partial differential equations with one parameter."

L. P. Copeland: "Concerning the theory of invariants of plane n-lines."

T. H. Gronwall: "On the summability of Fourier's series."

T. H. Gronwall: "On Lebesgue's constants in the theory of Fourier's series."

T. H. Gronwall: "On the degree of convergence of Laplace's series."

N. J. Lennes: "Note on Lebesgue and Pierpont integrals."

N. J. Lennes: "Finite sets and the foundations of arithmetic."

H. Bateman: "The expression of the equation of the general quartic curve in the form $A/xx' + B/yy' + C/zz' = 0$."

H. Bateman: "Sonin's polynomials and their relation to other functions."

Dunham Jackson: "On the accuracy of trigonometric interpolation."

C. E. Wilder: "On the degree of approximation to discontinuous functions by trigonometric sums."

Edward Kasner: "Systems of curves connected with equilong transformations."

The next regular meeting of the society will be held at Columbia University on Saturday, April 26. The Chicago Section will meet at the University of Chicago on Friday and Saturday, March 21–22. The San Francisco Section meets at Stanford University on Saturday, April 12.

F. N. Cole,
Secretary

THE ACADEMY OF SCIENCE OF ST. LOUIS

At a recent meeting of the academy held on February 17, 1913, Professor Nipher presented an abstract of a paper soon to be published by the academy, entitled "A Local Magnetic Storm."

The phenomena were produced by means of two steel magnets, placed on opposite sides of a magnetic needle, as in the Gaussian method of deflection. The needle was completely enclosed in a copper cylinder. Its motion was observed through a small glass window, covered with wire gauze, by